

<p style="text-align: center;">Notice of Allowability</p>	Application No.	Applicant(s)	
	09/972,158	MORIGAKI ET AL.	
	Examiner Tracy Dove	Art Unit 1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 2/18/04.
2. ☒ The allowed claim(s) is/are 1 and 4-8.
3. ☒ The drawings filed on 09 October 2001 are accepted by the Examiner.
4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☒ All b) ☐ Some* c) ☐ None of the:
 1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

- | | |
|---|---|
| <ol style="list-style-type: none"> 1. <input type="checkbox"/> Notice of References Cited (PTO-892) 2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) 3. <input type="checkbox"/> Information Disclosure Statements (PTO-1449 or PTO/SB/08),
Paper No./Mail Date _____ 4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit
of Biological Material | <ol style="list-style-type: none"> 5. <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) 6. <input type="checkbox"/> Interview Summary (PTO-413),
Paper No./Mail Date _____ 7. <input checked="" type="checkbox"/> Examiner's Amendment/Comment 8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance 9. <input type="checkbox"/> Other _____ |
|---|---|

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Daniel Bucca on 5/13/04. Applicant requested withdrawn method claim 8 be amended to include all the limitations of allowable claim 1 and then rejoined. Claim 8 has been amended as such and rejoined.

The application has been amended as follows:

Cancel claim 2.

1. (amended) A lithium polymer battery including: a positive electrode comprising a lithium-containing complex oxide; a negative electrode comprising a material capable of absorbing and desorbing a lithium ion; and a separator comprising a liquid organic electrolyte and a host polymer retaining said organic electrolyte;

wherein said host polymer is a crosslinked copolymer, which has a main-chain comprising a vinylidene fluoride unit, and a side-chain comprising an alkylene oxide unit and at least one of either an acrylate unit or methacrylate unit, wherein said side-chain is composed of polyethylene glycol diacrylate or polyethylene glycol dimethacrylate, said diacrylate or dimethacrylate having an average molecular weight of 300 to 1,600; and,

wherein the content of said side-chain in said copolymer is 1 to 30 wt%.

8. (amended) A method for producing a lithium polymer battery including:

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(1) a step of preparing an electrode assembly by laminating a positive electrode comprising a lithium-containing complex oxide and a negative electrode comprising a material capable of absorbing and desorbing a lithium ion while interposing therebetween a copolymer, said copolymer having a main-chain comprising a vinylidene fluoride unit and a side-chain comprising an alkylene oxide unit and at least one of either an acrylate unit or methacrylate unit, wherein said side-chain is composed of polyethylene glycol diacrylate or polyethylene glycol dimethacrylate, said diacrylate or dimethacrylate having an average molecular weight of 300 to 1,600;

(2) a step of housing said electrode assembly in a battery case, and then introducing a polymerization initiator for said copolymer and a liquid organic electrolyte therein and sealing said battery case; and

(3) a step of forming a separator between said positive electrode and said negative electrode by heating said sealed battery to crosslink said copolymer and make the crosslinked copolymer retain said organic electrolyte; and,

wherein the content of said side-chain in said copolymer is 1 to 30 wt%.

The following is an examiner's statement of reasons for allowance: the claims are directed toward a lithium polymer battery having a separator containing a liquid organic electrolyte and a crosslinked copolymer that retains the organic electrolyte. The copolymer has a main-chain comprising a vinylidene fluoride unit and a side-chain composed of polyethylene glycol diacrylate or polyethylene glycol dimethacrylate, said diacrylate or dimethacrylate having

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an average molecular weight of 300 to 1,600. The side chain compound of the claimed invention is 1-30 wt% of the copolymer

The prior art of record does not teach the specific crosslinked copolymer of the claimed invention. Amano teaches a solid state electrolyte (separator) includes an electrolyte solution and a matrix polymer of a polyvinylidene fluoride compound having a side chain introduced thereto by electron beam emission to form a gel polymer electrolyte (abstract). The side chain compound may be an aliphatic acrylate compound such as an alkylene oxide acrylate compound (0013-0015). Amano does not teach the acrylate compound has an average molecular weight of 300-1,600 and the side chain is 1-30 wt% of the copolymer. Table 1 provides evidence that the average molecular weight of the acrylate compound and the weight percent of the side chain in the copolymer are critical to the performance of the copolymer.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tracy Dove whose telephone number is 571-272-1285. The examiner can normally be reached on Monday-Thursday (9:00-7:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Pat Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

May 13, 2004



Patrick Ryan
Supervisory Patent Examiner
Technology Center 1700